THE EXCAVATIONS OF CARLOS RIBEIRO

In the 1860s, Portuguese geologist Carlos Ribeiro found worked flints in Miocene strata which suggest a much earlier date for the emergence of modern humans than that accepted by mainstream scientists today.

by Michael A. Cremo © 2000

Research Associate in
History and Philosophy of Science
Bhaktivedanta Institute
9701 Venice Boulevard #5
Los Angeles, CA 90034, USA
Website: www.mcremo.com

A CONTROVERSIAL EPISODE IN 19TH-CENTURY ARCHAEOLOGY

My theoretical approach to archaeology is informed by the *Puranas*, the historical writings of ancient India, which posit a human presence extending much further back in time than most archaeologists today are prepared to accept (Cremo, 1999). Therefore I was intrigued when I learned of some anomalously old stone tools discovered by Carlos Ribeiro, a Portuguese geologist of the 19th century.

While I was going through the writings of the American geologist J. D. Whitney (1880) who reported evidence for Tertiary human beings in California,[1] I encountered a sentence or two about Ribeiro having found flint implements in Miocene formations near Lisbon. The Tertiary comprises a group of geological periods—the Pliocene, Miocene, Oligocene, Eocene and Palaeocene—extending from 2 million to 65 million years ago. The Miocene extends from 5 million to 25 million years ago. According to current accounts, the oldest anatomically modern humans came into existence about 100,000 to 150,000 years ago, and the oldest hominids, human ancestors, go back about 4 million years.

Later I saw Ribeiro's name again, this time in the 1957 edition of *Fossil Men* by Boule and Vallois, who rather curtly dismissed his work. I was led, however, by Boule and Vallois to the 1883 edition of *Le Préhistorique* by Gabriel de Mortillet, who gave a favourable report of Ribeiro's discoveries. From de Mortillet's bibliographic references, I went to Ribeiro's original reports. Using all of this material, I wrote about Ribeiro's discoveries and their reception in *Forbidden Archeology* (Cremo and Thompson, 1993).

When I learned last year that the European Association of Archaeologists annual meeting for the year 2000 was going to be held in Lisbon, I proposed a paper on Ribeiro's work for the section on the history of archaeology. Previously I had relied only on published records. But for my new research, I visited the Museu Geológico in Lisbon, where I studied a collection of Ribeiro's artifacts. The artifacts were stored out of sight, below the display cases featuring more conventionally acceptable artifacts from the Portuguese Stone Ages.[2] After spending a week examining and photographing the artifacts, I went to the library of the Institute of Geology and Mines at Alfragide to study Ribeiro's personal papers,[3] and later I went to visit some of the sites where Ribeiro collected his specimens.[4]

At the archaeology conference in Lisbon, I presented Ribeiro's discoveries as a case study, showing how contemporary archaeology treats facts that no longer conform to accepted views. Keep in mind that for most current students of archaeology, Ribeiro and his discoveries simply do not exist. You have to go back to textbooks printed over 40 years ago to find even a mention of him. Did Ribeiro's work really deserve to be so thoroughly forgotten? I think not.

A SUMMARISED HISTORY OF RIBEIRO'S DISCOVERIES

In 1857, Ribeiro was named to head the Geological Commission of Portugal, and he would also be elected to the Portuguese Academy of Sciences. In 1860, Ribeiro learned that flints bearing signs of human work had been found in Tertiary beds between Carregado and Alemquer, two small towns in the basin of the Tagus River, about 35 to 40 kilometres northeast of Lisbon. Ribeiro began his own investigations, and in many localities found "flakes of worked flint and quartzite in the interior of the beds".

Ribeiro found himself in a dilemma. The geology of the region indicated the limestone beds were of Tertiary age, but Ribeiro (1873a:97) felt he must submit to the then prevalent idea that humans were not older than the Quaternary. (The Quaternary is the most recent geological age, comprising the Pleistocene and Holocene. It extends from two million

years ago to the present.) Ribeiro therefore assigned Quaternary ages to the implement-bearing strata (Ribeiro, 1866; Ribeiro and Delgado, 1867).

Upon seeing the maps and accompanying reports, geologists in other countries were perplexed. The French geologist E. de Verneuil wrote to Ribeiro on May 27, 1867, asking him to send an explanatory note; this was read at the June 17 meeting of the Geological Society of France and later published in the bulletin of the Society (Ribeiro, 1867). On July 16, de Verneuil wrote once more to Ribeiro, again objecting to his placing the Portuguese formations in the Quaternary and insisting they must be Tertiary.

During that same year, Ribeiro learned that the Abbé Louis Bourgeois, a reputable investigator, had reported finding stone implements in Tertiary beds in France, and that some authorities supported him (de Mortillet, 1883:85). Under the twin influences of de Verneuil's criticism and the discoveries of Bourgeois, Ribeiro began reporting that implements of human manufacture had been found in Miocene formations in Portugal (Ribeiro, 1871, 1873a:98).

From the standpoint of modern geology, Ribeiro's assessment of the age of the implement-bearing formations in the Tagus River valley near Lisbon is correct. The offical geological maps of Portugal show the formations at Ribeiro's key sites to be Early to Middle Miocene (Zbyszweski and Ferreira, 1966:9–11).

In 1871, Ribeiro exhibited to the members of the Portuguese Academy of Science at Lisbon a collection of flint and quartzite implements, including those gathered from the Tertiary formations of the Tagus valley, and published a study on them (Ribeiro, 1871). The implements described in this study show not only striking platforms, bulbs of percussion and worked edges, but also signs of use.

In 1872, at the International Congress of Prehistoric Anthropology and Archaeology meeting in Brussels, Ribeiro gave another report on his discoveries and displayed more specimens, mostly pointed flakes. A. W. Franks, Conservator of National Antiquities and Ethnography at the British Museum, stated that some of the specimens were the product of intentional work.

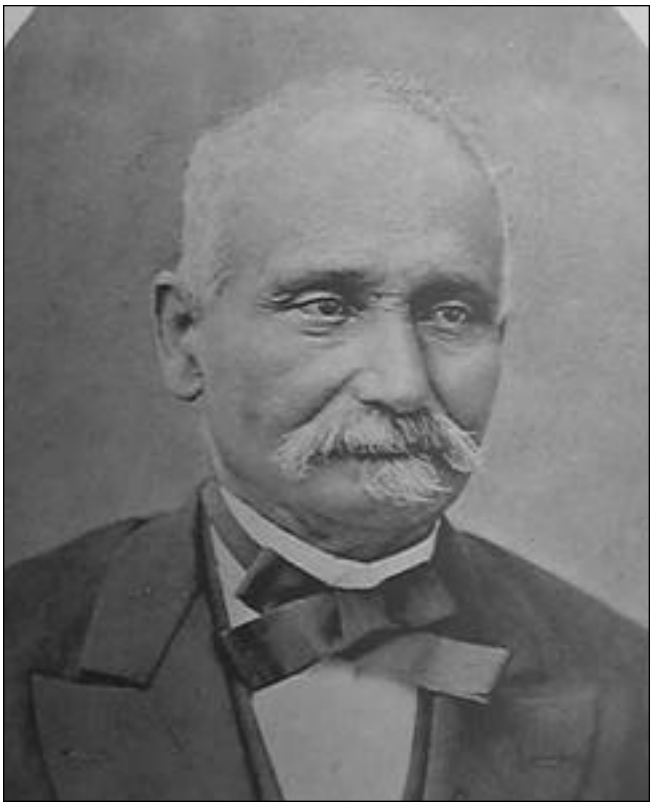
Ribeiro's Miocene flints made an impressive showing, but remained controversial. At the Paris Exposition of 1878, Ribeiro displayed specimens of Tertiary flint tools in the gallery of anthropological science. De Mortillet visited Ribeiro's exhibit and, in the course of examining the specimens carefully, decided that they had indubitable signs of human work.

De Mortillet, along with his friend and colleague Emile Cartailhac, enthusiastically brought other archaeologists to see Ribeiro's specimens, and they were all of the same opinion: the flints were definitely made by humans. Cartailhac then photographed the specimens, and de Mortillet later presented pictures in his *Musée Préhistorique* (G. and A. de Mortillet, 1881).

De Mortillet (1883:99) wrote: "The intentional work is very well established, not only by the general shape, which can be deceptive, but much more conclusively by the presence of clearly evident striking platforms and strongly developed bulbs of percussion."

Leland W. Patterson (1983), an expert in distinguishing artifacts from "naturefacts", believes that the bulb of percussion is the most important sign of intentional work on a flint flake. In addition to the striking platforms and bulbs of percussion, some of Ribeiro's specimens had several long vertical flakes removed in parallel, something not likely to occur in the course of random battering by the forces of nature.

De Mortillet (1883:99–100) further observed: "Many of the specimens, on the same side as the bulb of percussion, have hollows with traces and fragments of sandstone adhering to them, a fact which establishes their original position in the strata." In other words, they had not slipped into the Miocene beds in more recent times.



Carlos Ribeiro (1813–1882) was appointed head of the Geological Commission of Portugal in 1857.

RIBEIRO IS VINDICATED

At the 1880 meeting of the International Congress of Prehistoric Anthropology and Archaeology, held in Lisbon, Portugal, Ribeiro served as general secretary.[5] Although very busy with all of the details of organising the event, and somewhat ill, he delivered a report on his artifacts and displayed more specimens that were "extracted from Miocene beds" (Ribeiro, 1884:86).

In his report ("L'homme tertiaire en Portugal"), Ribeiro (1884:88) stated:

"The conditions in which the worked flints were found in the beds are as follows:

(1) They were found as integral parts of the beds themselves.

(2) They had sharp, well-preserved edges, showing that they had not been subject to transport for any great distance.

(3) They had a patina similar in colour to the rocks in the strata of which they formed a part."

The second point is especially important. Some geologists claimed that the flint implements had been introduced into Miocene beds by the floods and torrents that periodically washed over this terrain. According to this view, Quaternary flint implements may have entered into the interior of the Miocene beds through fissures and been cemented there, acquiring over a long period of time the coloration of the beds (de Quatrefages, 1884:95). But if the flints had been subjected to such transport, then the sharp edges would most probably have been damaged, and this was not the case.

The Congress assigned a special commission of scientists the task of directly inspecting the implements and the sites from which they had been gathered. On September 22, 1880, at six in the morning, the commission members boarded a special train and

proceeded north from Lisbon, getting off at Carregado. They proceeded further north to Otta, and two kilometres northeast from Otta arrived at the southern slopes of the hill called Monte Redondo. At that point, the scientists dispersed into various ravines in search of flints.[6]

Paul Choffat (1884a:63), secretary of the commission, later reported to the Congress: "Of the many flint flakes and apparent cores taken from the midst of the strata under the eyes of the commission members, one was judged as leaving no doubt about the intentional character of the work." This was the specimen found *in situ* by Bellucci. Choffat then noted that Bellucci had found on the surface other flints with incontestable signs of work. They appeared to be Miocene implements that had been removed from the Miocene conglomerates by atmospheric agencies.

De Mortillet (1883:102) gave an informative account of the excursion to Otta and Bellucci's remarkable discovery:

> "The members of the Congress arrived at Otta, in the middle of a great freshwater formation. It was the bottom of an ancient lake, with sand and clay in the centre and sand and rocks on the edges. It is on the shores that intelligent beings would have left their tools, and it is on the shores of the lake that once bathed Monte Redondo that the search was made. It was crowned with success.
>
> "The able investigator of Umbria, Mr Bellucci, discovered *in situ* a flint bearing incontestable signs of intentional work. Before detaching it, he showed it to a number of his colleagues. The flint was strongly encased in the rock. He had to use a hammer to extract it. It is definitely of the same age as the deposit. Instead of lying flat on a surface onto which it could have been secondarily recemented at a much later date, it was found firmly in place on the underside of a ledge extending over a region removed by erosion. It is impossible to desire a more complete demonstration attesting to a flint's position in its strata."

Study of the fauna and flora in the region around the Monte Redondo site showed that the formations present there can be assigned to the Tortonian stage of the Late Miocene period (de Mortillet, 1883:102). Some modern authorities consider the Otta conglomerates to be from the Burdigalian stage of the Early Miocene (Antunes et al., 1980:139). After the excursion, the commission members discussed Ribeiro's artifacts and came to a conclusion that was generally favourable to the authenticity of the discoveries (Choffat, 1884b:92–93).

Altogether, there seems little reason why Ribeiro's discoveries should not be receiving some serious attention, even today. Here we have a professional geologist, the head of Portugal's Geological Commission, making discoveries of flint implements in Miocene strata. The implements resembled accepted types, and they displayed characteristics that modern experts in lithic technology accept as signs of human manufacture. To resolve controversial questions, a congress of Europe's leading archaeologists and anthropologists deputed a committee to conduct a first-hand investigation of one of the sites of Ribeiro's discoveries. There, a scientist discovered *in situ* an implement in a Miocene bed, as witnessed by several other members of the committee.

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RIBEIRO'S FINDINGS ENTER SCIENTIFIC OBLIVION

Carlos Ribeiro died in 1882. In 1889, his colleague Joaquim Fillipe Nery Delgado conducted some new explorations at Monte Redondo. Delgado recovered some artifacts, which he displayed at the 10th International Congress of Prehistoric Anthropology and Archaeology.

No artifacts bearing signs of human work were found in excavations he conducted. Delgado (1889:530) therefore declared he had not been able to duplicate Ribeiro's discoveries of worked flints in solid rock. But Delgado did see signs of human work on the flints found loose on the ground (1889:530). He said that many of these "are incontestably Tertiary and have been naturally separated from the underlying beds solely by the action of atmospheric agencies" (1889:529).

In the discussion that followed Delgado's talk, de Mortillet said he did not think Delgado's failure to find worked flints in his four excavations was all that significant. He pointed out that even in places very rich in artifacts, such as Chelles and St Acheul in France, one could go through many cubic metres of sediment without finding any flints showing signs of work (Delgado, 1889:532).

In 1905, in a memorial volume dedicated to Ribeiro, Delgado further distanced himself from the conclusions of his departed colleague (1905:33–34). Influenced by the discovery of *Pithecanthropus erectus* in Java in the 1890s, he cast doubt on the discoveries of Ribeiro. *Pithecanthropus*, an ape man, had been found without any stone tools in a formation that scientists considered to be from the very latest part of the Tertiary. Delgado implied that this ruled out the existence of humans like us in the Tertiary, anywhere in the world. He also implied that *Pithecanthropus* made it unlikely that similar precursors to modern humans would be found in the European Tertiary. South-East Asia, apparently, would be the place to look.

In 1942, Henri Breuil and G. Zbyszewski of the Geological Service of Portugal restudied the artifacts collected by Ribeiro. They suggested that some of them did not actually display any signs of intentional human work. And, not accepting the Tertiary age of the rest, they reclassified them as corresponding to accepted Pleistocene and Holocene industries, such as the Clactonian, Tayencian, Levalloisian, Mousterian, Upper Palaeolithic, Mesolithic and Neo-Eneolithic (Zbyszewski and Ferreira, 1966:85–86; Breuil and Zbyszewski, 1942).

Here is one example of such reclassification. Ribeiro (1871:14) described an implement of light-brown flint. It was one of several extracted from the Lower Miocene beds forming the hill called Murganheira. The implement from the Miocene beds at Murganheira has worked edges, two of them joining to form a

point. The point shows signs of use. On the tool itself is written "15.IV.1869 1.5 km N da Bemposta", indicating the artifact was found on April 15, 1869, 1.5 kilometres north of Bemposta, a locality just south of the Murganheira hill. On the new label prepared by the Geological Service of Portugal during the period of reclassification, the artifact is identified as an Upper Palaeolithic flint implement found by Ribeiro at Murganheira, near Alemquer. Apparently there was no disputing the artifactual nature of the object, but its age was assigned on the basis of its form rather than its geological provenance. The Upper Palaeolithic refers to a time in the later Pleistocene when humans of modern type were making stone tools of relatively advanced type.

Some time after this reclassification of Ribeiro's collection, the artifacts were removed from display at the Museo Geológico in Lisbon. Ribeiro and his artifacts entered into an oblivion from which they have yet to emerge.

A CONFLICT OF FACT AND THEORY

The history Carlos Ribeiro's discoveries demonstrates the complex interpretative interplay between geology and archaeology and evolutionary theories. In the 19th century, even though most European archaeologists were working within an evolutionary framework, the time dimension of the evolutionary process had not been settled, mainly because of the lack of skeletal evidence in appropriate geological contexts. The looseness of the evolutionary framework therefore allowed archaeologists to contemplate the existence of Tertiary humans.

That changed in the very last decade of the 19th century. With the discovery of *Pithecanthropus erectus*, Darwinists began to solidify an evolutionary progression that led from *Pithecanthropus*, at the Plio-Pleistocene boundary, to anatomically modern humans in the Late Pleistocene. This left no room for Tertiary humans anywhere in the world, and put the spotlight on South-East Asia as the place to look for Tertiary precursors to *Pithecanthropus*. Ribeiro's discoveries lost their relevance and gradually disappeared from the discourse on human origins.[7]

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A century later, things have changed somewhat. Africa is now generally recognised as the place where hominids first arose. For some time, the earliest tools were thought to date back only to the Early Pleistocene. But in recent years, archaeologists are once more pushing the onset of stone toolmaking well into the Tertiary. Oldowan tools have been found in the Pliocene at Gona, Ethiopia (Semaw et al., 1997). The tools, found in large numbers and described as surprisingly sophisticated, are about 2.5–2.6 million years old. Therefore, we should expect to find stone tools going back even further into the Tertiary.

Conventional candidates for the Tertiary toolmakers include the earliest *Homo* or one of the australopithecines (Steele, 1999:25). But there are other possibilities. Footprints described as anatomically modern occur in Pliocene volcanic ash, 3.7 million years old, at Laetoli, Tanzania (M. Leakey, 1979).[8] There is even evidence putting toolmakers close to the Iberian Peninsula, in Morocco, in the Late Tertiary (Onoratini et al., 1990). At the Ben Souda quarry near Fez, stone tools were found in place in the Saissian formation which had long been considered Pliocene. Noting the similarity of the Ben Souda tools to the Acheulean tools from a Middle Pleistocene formation at Cuvette de Sidi Abderrahman in the area of Casablanca, Onoratini et al. (1990:330) decided to characterise the part of the Saissian formation containing the tools at Ben Souda as also being Middle Pleistocene (repeating the early mistake of Ribeiro!). Another possibility that deserves to be considered is that there are tools of Acheulean type in the Tertiary of Morocco.

It may be noted that anatomically modern human skeletal remains have been found in the Tertiary (Pliocene) of Italy at Castenedolo (Ragazzoni, 1880; Sergi, 1884; Cremo and Thompson, 1993:422–432) and at Savona (de Mortillet, 1883:70; Issel, 1868; Cremo and Thompson, 1993:433–435). There may therefore be some reason, once more, to consider the possibility of Tertiary industries in Portugal.

Such a possibility is not much in favour today, as can be seen in a recent critical survey of evidence for the earliest human occupation of Europe (Roebroeks and Van Kolfschoten, 1995). The basic thrust of the book, which is a collection of papers presented at a conference on the earliest occupation of Europe (held at Tautavel, France, in 1993), is to endorse a short chronology, with solid evidence for first occupation occurring in the Middle Pleistocene at around 500,000 years. Other discoveries favouring a long chronology, perhaps extending into the earliest Pleistocene (1.8 to 2 million years) are mentioned, although the consensus among the authors of the Tautavel papers is that such evidence is highly questionable. The sites and the artifacts are nevertheless mentioned, and are not entirely dismissed. The editors and authors of individual chapters simply say that, in many cases, better confirmation of the age of the site and the intentional manufacture of the artifacts is required.

Given this liberal approach, Ribeiro's artifacts should have been mentioned in the chapter on the Iberian Peninsula (Raposo and Santonja, 1995). In that chapter, the authors give the impression that the oldest reported stone tool industries in Portugal are Early Pleistocene pebble industries, documented by Breuil and Zbyszewski (1942–1945). Raposo and Santonja (1995:13) called into question the dating of the pebble tool sites, concluding that they "do not document beyond doubt any Early Pleistocene human occupation". But the main point is this: although the industries reported by Breuil and Zbyszewski were not accepted, they were at least acknowledged. The same is true of other controversial sites indicating a possible Early Pleistocene occupation elsewhere in the Iberian Peninsula. Raposo and Santonja did not accept them, but they acknowledged their existence, thus offering current archaeologists the option of conducting further research to establish more firmly either the dates of the sites or the artifactual nature of the stone objects found there. Ribeiro's discoveries deserve similar treatment.

One possible objection is that although there is some reason to believe in a possible Early Pleistocene occupation or even a very

late Pliocene occupation of Europe, there is no reason to support a Miocene habitation. But there is a body of evidence that can provide a context in which the Miocene discoveries of Ribeiro might make some sense.

Miocene flint tools are reported from Puy de Boudieu, near Aurillac, in the department of Cantal in the Massif Central region of France (Verworn, 1905). The flint implements were found in layers of fluviatile sands, stones and eroded chalk, along with fossils of a typical Miocene fauna, including *Dinotherium giganteum*, *Mastodon longirostris*, *Rhinocerus schleiermacheri* and *Hipparion gracile*. The implement-bearing layers were covered with basalt flows (Verworn, 1905:17).

Verworn was very cautious in identifying the objects he found as objects manufactured by humans. Summarising his methodology, Verworn (1905:29) said:

> "Suppose I find in an interglacial stone bed a flint that bears a clear bulb of percussion, but no other symptoms of intentional work. In that case, I would be doubtful as to whether or not I had before me an object of human manufacture. But suppose I find there a flint which on one side shows all the typical signs of percussion, and which on the other side shows the negative impressions of two, three, four or more flakes removed by blows in the same direction. Furthermore, let us suppose one edge of the piece shows numerous successive small parallel flakes removed, all running in the same direction, and all, without exception, located on the same side of the edge. Let us suppose that all the other edges are sharp, without a trace of impact or rolling. Then I can say with complete certainty: it is an implement of human manufacture."

Verworn found about 200 specimens satisfying these criteria, and some of these also showed use-marks on the working edges.

Similar discoveries come from various places around the world. They include stone tools from the Miocene of Burma (Noetling, 1894), stone tools and artistically carved animal bone from the Miocene of Turkey (Calvert, 1874), incised and carved animal bones from the Miocene of Europe (Garrigou and Filhol, 1868; von Dücker, 1873), stone tools from the Miocene of Europe (Bourgeois, 1873), stone tools and human skeletal remains from the Miocene of California (Whitney, 1880), and a human skeleton from the Miocene of France (de Mortillet, 1883:72). For an extensive review of such evidence from all periods of the Tertiary, from all parts of the world, see Cremo and Thompson (1993).

Much of this evidence, like Ribeiro's evidence, disappeared from active consideration by archaeologists because of their commitment to a human evolutionary progression anchored on *Pithecanthropus erectus* (Cremo, forthcoming).

For example, the influential anthropologist William H. Holmes (1899:424), of the Smithsonian Institution, rejected the California gold mine discoveries reported by J. D. Whitney by saying: "Perhaps if Professor Whitney had fully appreciated the story of human evolution as it is understood today, he would have hesitated to announce the conclusions formulated, notwithstanding the imposing array of testimony with which he was confronted."

This flint implement was found by Carlos Ribeiro in Miocene formations at Espinhaço de Cão, Portugal.

Holmes (1899:470) specifically appealed the Java Man discovery, suggesting that Whitney's evidence should be rejected


Author Michael A. Cremo examines a formation at Monte Redondo, Portugal, the site of some of Carlos Ribeiro's discoveries.

because "it implies a human race older by at least one half than *Pithecanthropus erectus* of Dubois, which may be regarded as an incipient form of human only".

Not all of the evidence for Tertiary *Homo* comes from the 19th century. K. N. Prasad (1982:101), of the Geological Survey of India, described "a crude unifacial hand-axe pebble tool recovered from the Late Miocene–Pliocene (9–10 m.y. BP) at Haritalyangar, Himachal Pradesh, India". He added (1982:102): "The implement was recovered *in situ*, during remeasuring of the geological succession to assess the thickness of the beds. Care was taken to confirm the exact provenance of the material, in order to rule out the possibility of its derivation from younger horizons." Describing the tool itself, Prasad said (1982:102): "The quartz artefact, heart-shaped (90 x 70 mm), was obviously fabricated from a rolled pebble, the dorsal side of which shows rough flaking... On the ventral side, much of the marginal cortex is present at the distal end. Crude flaking has been attempted for fashioning a cutting edge. Marginal flaking at the lateral edge on the ventral side is visible." Prasad concluded (1982:103): "It is not impossible that fashioning tools commenced even as early as the later Miocene and evolved in a time-stratigraphic period embracing the Astian–Villafranchian."

RESURRECTING RIBEIRO

The discoveries of Ribeiro, and other evidences for Tertiary man uncovered by European archaeologists and geologists, are today attributed (if they are discussed at all) to the inevitable mistakes of untutored members of a young discipline.

Another possible explanation is that some of the discoveries are genuine, and were filtered out of the normal discourse of a community of archaeologists that had adopted, perhaps prematurely, an evolutionary paradigm that placed the origins of stone toolmaking in the Pleistocene.

But as the time-line of human toolmaking begins once more to reach back into the Tertiary, perhaps we should withhold final judgement on Ribeiro's discoveries. A piece of the archaeological puzzle that does not fit the consensus picture at a particular moment may find a place as the nature of the whole picture changes.

As an historian of archaeology, I believe that the discoveries of Ribeiro remain worthy of being considered in discussions of the earliest human occupation of Europe. I am pleased that the Museo Geológico in Lisbon is once more considering exhibiting the artifacts.[19] I also encourage new investigations at Monte Redondo and other sites identified by Ribeiro. ∞

About the Author:

Michael A. Cremo is a Research Associate in the History and Philosophy of Science with the Bhaktivedanta Institute, the science studies branch of the International Society for Krishna Consciousness. His work as an historian of archaeology is informed and inspired by his studies of the ancient Sanskrit writings of India. Among these writings are the *Puranas*, or histories, which speak of a human presence going back many millions of years, contradicting the current evolutionary theories of human origins.

Michael Cremo's most recent publication, "Puranic Time and the Archaeological Record", was originally presented as a paper at the World Archaeological Congress 3, New Delhi, 1994, and is included in the WAC3 Proceedings volume, *Time and Archaeology*, edited by Tim Murray (published by Routledge, 1999). Another paper, "The Later Discoveries of Boucher de Perthes at Moulin Quignon and their Bearing on the Moulin Quignon Jaw Controversy", has been selected for publication in the Proceedings of the XXth International Congress of History of Science, held in Liège, Belgium, July 19–26, 1997. His most recent book is *Forbidden Archeology's Impact* (1998). It documents the varied responses to his controversial book *Forbidden Archeology* (1993, co-authored with R. L. Thompson).

Endnotes

1. Whitney was a prominent geologist, and his reports on the discoveries were published by the Harvard University Museum of Comparative Zoology. The discoveries included anatomically modern human skeletal remains and stone artifacts, such as mortars and pestles and obsidian spear-points. They were found in gold mining tunnels that reached Eocene river channels, sealed under hundreds of feet of Miocene and Pliocene basalt flows in the Sierra Nevada mountains, at places such as Table Mountain in Tuolumne County, California. See Cremo and Thompson (1993:370–393, 439–452) for a review and discussion.

2. The Museu Geológico is located on the second floor of the 17th-century building in the historic centre of Lisbon that also houses the Academia Real das Ciências de Lisboa. I was able to match artifacts in the museum collection to 21 of the 128 drawings of artifacts shown in Ribeiro's principal publication on them (Ribeiro, 1871). Artifacts were matched to figures 13, 15, 16, 26, 27, 29, 36, 36b, 43, 45, 46, 55, 62, 63, 64, 73, 74, 77, 80, 82, 94. Assuming that all the artifacts figured in Ribeiro's 1871 publication were originally in the collection, it appears that most are now misplaced or otherwise missing.

3. The Instituto Geológico e Mineiro is located in Alfragide, in the newer western suburbs of Lisbon. The library of the Museu Geológico was transferred there from central Lisbon a few years ago.

4. The main guide to the localities I visited was Ribeiro's 1866 publication. The localities that I found, with considerable help from Portuguese friends who served as drivers and translators, were: (1) A site at the base of an escarpment that runs along the north side of the road that goes from Carregado to Cadafaes (Ribeiro, 1866:28). The site is about half the distance between Carregado and Cadafaes (now spelled Cadafais), and can be reached by a small dirt road going through some vineyards. (2) Quinta de Cesar in Carregado (Ribeiro, 1866:32). (3) The hill called Murganheira, east of Alemquer (Ribeiro, 1866:34). (4) Encosta da Gorda, near the eastern side of the Murganheira hill (Ribeiro, 1866:34). (5) The site on the right bank of the River Otta, where it passes the village of Otta (Ribeiro, 1866:42). (6) Monte Redondo, about two kilometres northeast of Otta (Ribeiro, 1866:45).

5. The Congress was held in the ornate main hall of the library in the building housing the Academia Real das Ciências, located on the floor below the Museu Geológico. The hall, still there today, is worth a visit.

6. In July 2000, I retraced the commission's route. There is a road leading east from Otta to Aveiras de Cima. Just as this road leaves Otta, one turns onto a small dirt road leading north and, following it, one eventually comes to Monte Redondo. Monte Redondo and the surrounding area remain in a natural condition, undisturbed by any construction. Although I suspect the landscape has changed somewhat, ravines on the southern slopes of Monte Redondo, like those described in the report of the conference expedition, are still visible. Their profiles resemble the one figured by de Mortillet (1883:101).

7. In the *Pithecanthropus erectus* discovery, Dubois associated a femur with a skullcap. Considering the historical impact of *Pithecanthropus* on consideration of evidence for Tertiary humans, it is noteworthy that modern researchers no longer consider the association genuine. When Day and Molleson (1973) carefully re-examined the femur, they found it not different from anatomically modern human femurs and distinct from all other *erectus* femurs.

8. Leakey herself (1979:453) said the prints were exactly like anatomically modern human footprints—a judgement shared by some physical anthropologists (Tuttle, 1981:91, 1987:517). Tim White said, "Make no mistake about it. They are like modern human footprints" (Johanson and Edey, 1981:250).

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